the elementary course to the work of the advanced course. When expectation or requirement concerning quality of work advances in correspondence with the advanced character of the courses, justice is most nearly assured by assigning approximately the same percentages of grades A, B, C in all courses.

The system as adopted emphasizes also the idea that the proposed percentages may not be precisely observed in any single class in a single year, especially among the smaller classes. But it is expected that the deficiencies in the assignments of particular grades of one year, will be balanced by the excesses of another year, so that there will be no constant tendency on the part of any instructor's grades to deviate widely from the percentages agreed upon. In very small classes the grades of a single year may deviate more widely from the ideal than those of the larger classes, but the combined reports of several years are expected to show essential approximation to the definitions.

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SPECIAL ARTICLES

A SAFE PORTABLE LAMP BATTERY

THE use for class work in physiological laboratories of zinc and ammonium chloride, or other forms of cells, is inconvenient and involves constant renewal. To supply large classes with dry batteries becomes an item of considerable expense. When the 110-volt direct current is available "lamp batteries" (or, properly speaking, lamp resistances) are more convenient, and cheaper to use; and if they are permanently installed under the work bench where the student can not alter the connections nor easily short circuit them, they are safe enough.

For many purposes, however, it is more convenient to have the lamps mounted on a piece of board six or eight inches square, so that the battery can be carried anywhere about the laboratory and connected with any socket by means of a cord and plug. The great disadvantage of such a portable battery is that with inexperienced students it may easily result in a serious blow-out. Thus with the ordinary arrangement of the lamps, as shown in Fig. 1, if B is the live wire and A is the grounded wire of the city lines (and one is usually grounded), no harm results if E happens to come in contact with a gas or water pipe. But if A is the live wire, and one happens (as there is an even chance of doing) to have pushed the plug into the socket so that the lamp C is nearest to the grounded line, then the whole pressure of the city system bears upon any chance contact of F with any metal object leading to ground.

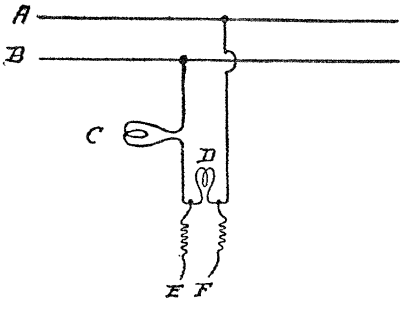

FIG. 1

To avoid this danger the form of battery shown in Fig. 2 has proved convenient. To give the same current the lamps C and C' in Fig. 2 must be twice the size (twice the current consumption and illuminating power, or in other words half the resistance) of C in

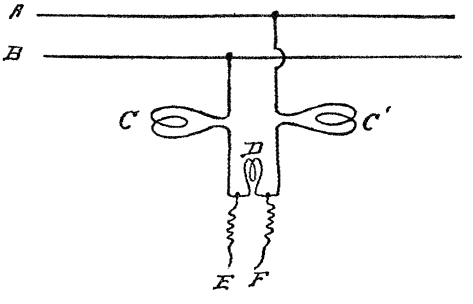

FIG. 2

Fig. 1. As both sides of the battery are then the same, it does not matter whether A or B is the live wire, nor which way the plug is put into the socket. If E or F happens to touch a grounded object, the lamp on that side merely

brightens (they are usually barely luminous), while that on the other side becomes entirely dark. For most physiological purposes a suffi-

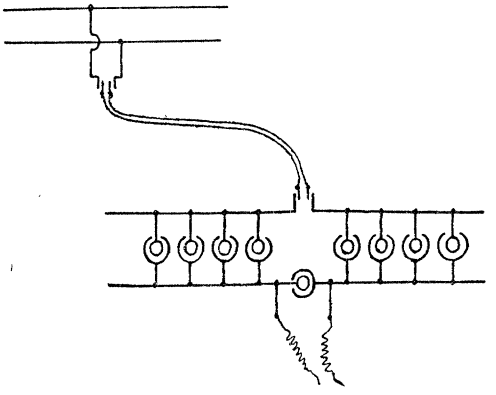

FIG. 3

cient current is obtained if C and C' are 80-watt carbon filament lamps and D is a 50-watt lamp. For some physiological induction coils (*e. g.*, the Harvard coil) it is necessary, however, to use larger lamps (120 watts) in C and C'. If still more current is wanted two or more sockets can be screwed to the board on each side, connected in parallel and filled with lamps until the needed current is obtained. Fig. 3 shows the arrangement of the sockets on the board.

In Fig. 4 is shown a convenient method of wiring the entire student laboratory for recording time. The figure shows at the left the lamp battery and the clock. The latter may be placed either in series with the signal magnets or so as to short-circuit the current, as it is in the diagram. The signal magnets must all be arranged on the line in series, each with a short-circuiting key to be closed when the time record at that place is to be discontinued or the signal magnet disconnected. With this arrangement it is not easy for one careless student to upset the entire system, and he is easily located if he does. One lamp battery operates effectively a large number of signal magnets in series.

When, as in work with the graphic method, it is desired to have an automatic record on the smoked paper of the instant at which some nerve was stimulated, the arrangement shown at the right in Fig. 4 is convenient. It consists merely of another lamp battery, induction coil and a double knife-edge switch. One blade of the switch is connected as a making and breaking key in the coil circuit, and the other as a short-circuiting key in the time circuit. Thus the interval of stimulation when the key is closed is indicated on the graphic record by the cessation of the movements of the signal magnet, and the time record recommences the instant the stimulation is ended by the reopening of the key.

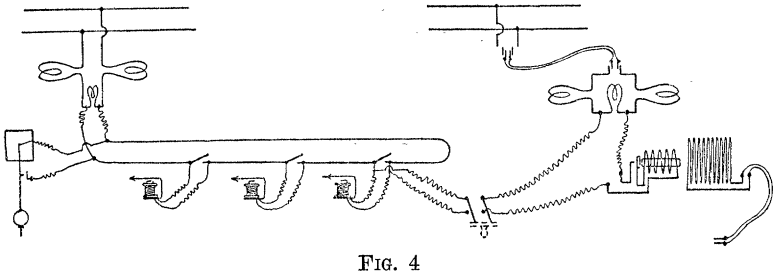

FIG. 4

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A SIMPLE DEVICE FOR DEMONSTRATING THE TEMPERED SCALE

THE diatonic scale, consisting of a succession of eight tones and containing three intervals known as "major second intervals," two known as "minor second intervals" and two "half-tones," is not adapted to musical instruments of "fixed pitch" (*e. g.*, the piano, harp, etc.) for the reason that it does not without a multiplicity of keys (strings) allow of transposition or change of keys.

For fixed-pitch instruments, therefore, the scale is modified in the following manner. First, an additional tone is inserted in each of the larger intervals (major and minor seconds)